

MYCOTAXON

<http://dx.doi.org/10.5248/126.177>

Volume 126, pp. 177–182

October–December 2013

**New records of *Puccinia* on *Poaceae*
from Khyber Pakhtunkhwa, Pakistan**A. ISHAQ^{1*}, N.S. AFSHAN² & A.N. KHALID¹¹*Department of Botany & ²Centre for Undergraduate Studies, University of the Punjab,
Quaid-e-Azam Campus, Lahore, 54590, Pakistan*CORRESPONDENCE TO: aamna_ishaq@yahoo.com

ABSTRACT — *Puccinia arthraxonis-ciliaris* and *P. pseudocesatii* were collected from Khyber Pakhtunkhwa and are new records for Pakistan.

KEY WORDS — Naran, *Pucciniales*, rust fungi

Introduction

Khyber Pakhtunkhwa (KPK), formerly known as the Northwest Frontier Province (NWFP), is one of the five provinces of Pakistan, located in the northwest of the country. It is situated at approximately 34.00°N 71.32°E (FIG. 1). Khyber Pakhtunkhwa is famous for hill coniferous forests, herbal plants, and large biodiversity. This floristically rich area is affected by many biotic and abiotic stresses including plant diseases such as leaf blights, red rot, smut, mosaic, and rust (Asad et al. 2007). One hundred seventy taxa of rust fungi have been reported from this area (Afshan & Khalid 2008, 2009; Afshan et al. 2007, 2008a,b,c,d, 2010; Khalid & Afshan 2009; Ahmad et al. 1997; Iqbal et al. 2008). The number of rust species recorded from this area is expected to increase in future due to extensive exploration.

We describe below three new rusts from Khyber Pakhtunkhwa that bring the total rust taxa recorded from the area to 173: *Puccinia pseudocesatii* on *Dichanthium annulatum* and *P. arthraxonis-ciliaris* on *Arthraxon* sp. (both new records for Pakistan) and *P. helictotrichi* var. *pakistanica* on *Helictotrichon junghuhnii*.

Materials & methods

During an exploration of the rust diversity in KPK, rust infected plants and their inflorescences were collected from different areas of the province and compared morphological with earlier herbarium collections. Freehand sections & scrape mounts

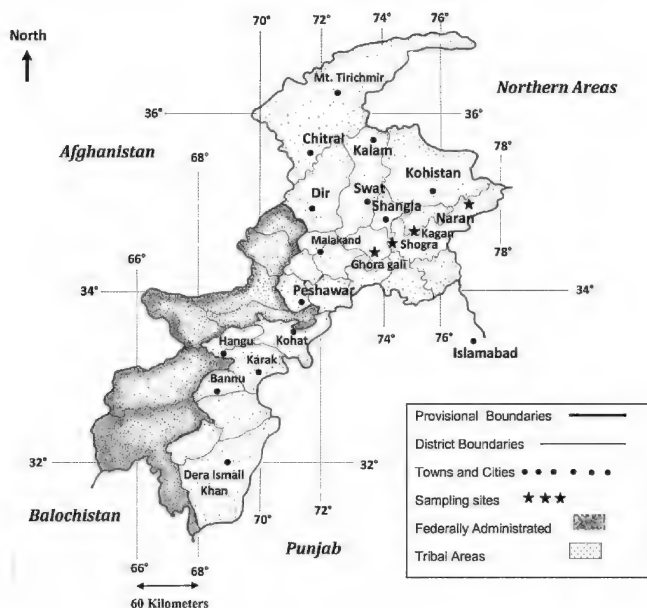


FIGURE 1: Map of Khyber-Pakhtunkhwa showing sampling sites.

of infected plant materials were made in lactic acid. The plants were photographed and infected portions were observed under stereomicroscope. Twenty spores of each spore state were examined under microscope (Nikon YS 100) and paraphyses and spore dimensions were taken by an Ocular micrometer (Zeiss Eyepiece Screw Micrometer). Sections, paraphyses and spores were microphotographed by digiporo-Labomed. Illustrations of spores and paraphyses were made under Lucida camera (Ernst Leitz Wetzlar Germany).

New records

Puccinia arthraxonis-ciliaris Cummins, Uredineana 4: 16 (1953)

FIG. 2

SPERMOGONIA, AECIA & UREDINIA not found. TELIA amphigenous, black, scattered. TELIOSPORES ellipsoid to oblong-ellipsoid, light brown, 1–2 celled, mostly 2–celled spores $19\text{--}21\text{--}28 \times 42\text{--}49\text{--}(57) \mu\text{m}$; apex $6\text{--}10 \mu\text{m}$ thick; wall $2\text{--}4 \mu\text{m}$ thick; pedicel hyaline, $5\text{--}9 \times (23\text{--})29\text{--}54 \mu\text{m}$. 1-celled spores $21\text{--}26\text{--}(31) \times (26\text{--})34\text{--}38 \mu\text{m}$; apex $7\text{--}10 \mu\text{m}$ thick; wall $2\text{--}3 \mu\text{m}$ thick; pedicel up to $44 \mu\text{m}$ long.

MATERIAL EXAMINED: PAKISTAN, KHYBER PAKHTUNKHWA, Ghora gali, 1691 m a. s. l., on *Arthraxon* sp., stage III, 30 April 2008. A. Ishaq AM69 (LAH 1166).

COMMENTS: *Puccinia arthraxonis-ciliaris* has previously been reported on *Arthraxon hispidus* (Thunb.) Makino from China, India, Japan, Mauritius,

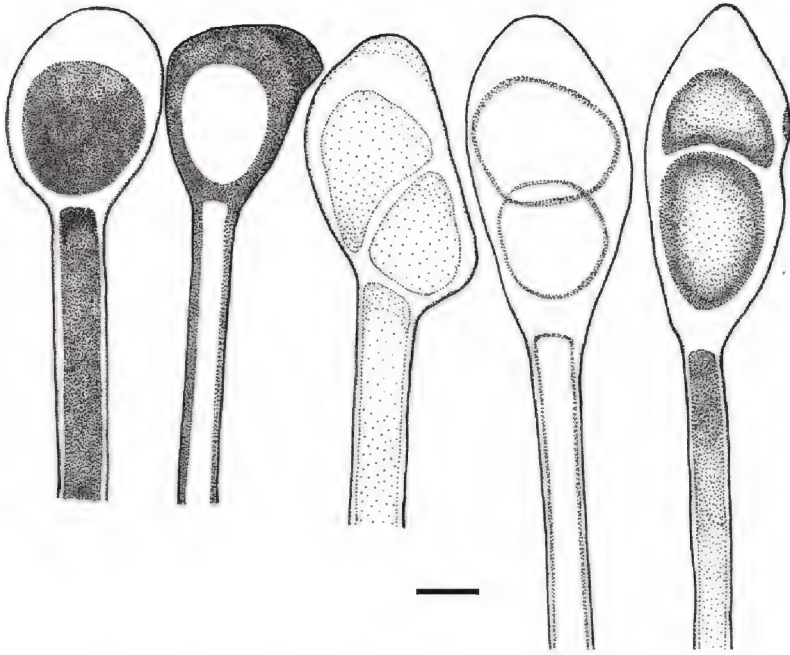


FIGURE 2: *Puccinia arthraxonis-ciliaris*. Teliospores. Scale bar = 14 μm .

New Guinea, and Philippines (Cummins 1971 and represents a new species record for Pakistan. *Puccinia arthraxonis* (Henn.) Syd. et al. has previously been reported from Pakistan on different *Arthraxon* species (Ahmad 1976; Khalid et al. 1993).

Puccinia pseudocesatii Cummins, Uredineana 4: 71 (1953)

FIG. 3

SPERMOGONIA, AECIA & UREDINIA not found. TELIA amphigenous, pulvinate, black. TELIOSPORES ellipsoid, hyaline to light brown, 2-celled, 3-celled rarely, $10\text{--}20 \times (35\text{--})44\text{--}60 \mu\text{m}$, sometimes upper cell is wider than lower one, $10\text{--}27 \mu\text{m}$ wide; apex $5\text{--}15(-18) \mu\text{m}$ thick; wall $1.5\text{--}2 \mu\text{m}$ thick; pedicel hyaline, fragile, $5\text{--}8 \times 23\text{--}67 \mu\text{m}$.

MATERIAL EXAMINED: PAKISTAN, KHYBER PAKHTUNKHWA, Ghora Gali, 2009 m a.s.l., on *Dichanthium annulatum* (Forssk.) Stapf, stage III, 29 March 2009, A. Ishaq AM31 (LAH 1172)

COMMENTS: *Puccinia pseudocesatii* has previously been reported on *Bothriochloa ischaemum* (L.) Keng and *Chrysopogon gryllus* (L.) Trin. from southern Europe

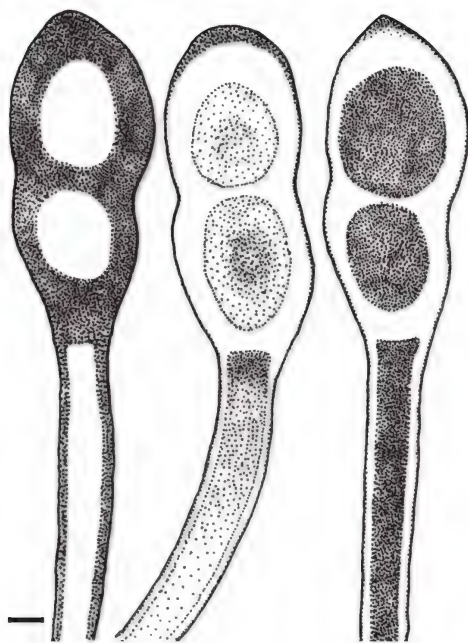


FIGURE 3: *Puccinia pseudocesatii*. Teliospores. Scale bar = 17 μ m.

(Cummins 1971). From Pakistan, *P. cesatii* J. Schröt., *P. duthiei* Ellis & Tracy, *P. dichanthii* Afshan & Khalid, *Uromyces andropogonis-annulati* Syd. et al. and *U. clignyi* Pat. & Har. have previously been reported on *Dichanthium annulatum* (Ahmad 1956a,b; Hasnain et al. 1959; Ghaffar and Kafi 1968; Afshan et al. 2010).

This is a new record for Pakistan and *Dichanthium annulatum* represents a new host for this rust fungus.

Puccinia helictotrichi var. *pakistanica* Afshan & Khalid, Mycotaxon 112: 487 (2010)

FIG. 4

SPERMOGONIA and AECIA unknown. UREDINIA scattered on whole leaf surface, naked, amphigenous, golden brown. UREDINIOSPORES globose to subglobose, hyaline, 15–24 $\times$ 20–26 μ m; wall 1.5–3 μ m thick, hyaline, echinulate; germ pore obscure. TELIA amphigenous, golden brown, loculate, 100–200 $\times$ 40–80 μ m. TELIOSPORES elongated to cylindrical, 14–24 $\times$ 36–49 μ m; apex 2–3.7 μ m thick; wall 1.5–3 μ m thick; pedicel hyaline, 3–7 $\times$ 3.3–13 μ m.

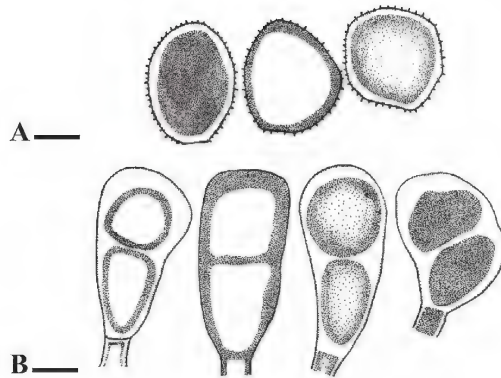


FIGURE 4: *Puccinia helictotrichi* var. *pakistanica*.

A. Urediniospores showing echinulate surface ornamentation. B. Teliospores.

Scale bars: A = 9 μ m; B = 10 μ m.

MATERIAL EXAMINED: PAKISTAN, KHYBER PAKHTUNKHWA, Shogran, 2362 m a.s.l., on *Helictotrichon junghuhnii* (Buse) Henrard (= *H. asperum* (Munro ex Thwaites) Bor), stages II & III, 28 August 2010, A. Ishaq AM04 (LAH 1145); Naran, 2427–3200 m a.s.l., on leaves of *Helictotrichon* sp., stages II & II, 29 August 2008, A. Ishaq AM15 (LAH 1149).

COMMENTS: *Puccinia helictotrichi* var. *pakistanica* has been previously reported on *Helictotrichon junghuhnii* (= *H. virescens* (Nees ex Steud.) Henrard) from Fairy Meadows, Northern Areas (Afshan et al. 2010). This represents a new record for Khyber Pakhtunkhwa.

Acknowledgements

We sincerely thank Dr. Abdul Rehman Niazi (Department of Botany, University of the Punjab, Lahore, Pakistan) and Dr. Omar Páino Perdomo (Dominican Society of Mycology, Santo Domingo, Dominican Republic) for their valuable suggestions to improve the manuscript and acting as presubmission reviewers.

Literature cited

- Afshan NS, Khalid AN. 2008. New rust fungi on noxious weeds from Pakistan. *Pak. J. Phytopathol.* 20(1): 82–87.
- Afshan NS, Khalid AN. 2009. New records of *Puccinia* and *Pucciniastrum* from Pakistan. *Mycotaxon* 108: 137–146. <http://dx.doi.org/10.5248/108.137>
- Afshan NS, Khalid AN, Abbasi M, Niazi AR. 2007. New records of rust fungi from Pakistan. *Mycotaxon* 101: 233–237.
- Afshan NS, Khalid AN, Niazi AR. 2008a. New records and distribution of rust fungi from Pakistan. *Mycotaxon* 105: 257–267.
- Afshan NS, Khalid AN, Niazi AR. 2008b. New records of graminicolous rust fungi from Pakistan. *Pak. J. Bot.* 40(3): 1279–1283.

- Afshan NS, Khalid AN, Javed H. 2008c. Further addition to the rust flora of Pakistan. Pak. J. Bot. 40(3): 1285–1289.
- Afshan NS, Berndt R, Khalid AN, Niazi AR. 2008d. New graminicolous rust fungi from Pakistan. Mycotaxon 104: 123–130.
- Afshan NS, Niazi AR, Khalid AN. 2010. Three new species of rust fungi from Pakistan. Mycol. Progress 9: 485–490. <http://dx.doi.org/10.1007/s11557-010-0655-8>
- Ahmad S. 1956a. *Uredinales* of Pakistan. Biologia 2: 29–101.
- Ahmad S. 1956b. Fungi of Pakistan. Biol. Soc. Pak., Lahore.
- Ahmad S. 1976. Contribution to the fungi of Pakistan. XVII. Sultania 2: 17–21.
- Ahmad S, Iqbal SH, Khalid AN. 1997. Fungi of Pakistan. Sultan Ahmad Mycological society of Pakistan, Department of Botany, University of the Punjab, Lahore, Pakistan.
- Asad S, Iftikhar S, Munir A, Ahmad I, Ayub N. 2007. Pathogenic diversity in *Bipolaris sorokiniana* isolates collected from different Wheat growing areas of the Punjab and NWFP of Pakistan. Pak. J. Bot. 39(6): 2225–2231.
- Bahri B, Shah S, Hussain S, Leconte M, Enjalbert J, Pope CDV. 2011. Genetic diversity of the wheat yellow rust population in Pakistan and its relationship with host resistance. Plant Pathology 60: 649–660. <http://dx.doi.org/10.1111/j.1365-3059.2010.02420.x>
- Cummins GB. The rust fungi of cereals, grasses and bamboos, Springer-Verlag, New York; 1971. <http://dx.doi.org/10.1007/978-3-642-88451-1>
- Fazal H, Nisar A, Rashid A, Farooq S. 2010. A checklist of phanerogamic flora of Haripur Hazara, Khyber Pakhtunkhwa, Pakistan. Pak. J. Bot. 42(3): 1511–1522.
- Ghaffar A, Kafi A. 1968. Fungi of Karachi. Pak. J. Bot. 4: 195–208.
- Hasnain SZ, Khan A, Zaidi AJ. 1959. Rusts and smuts of Karachi. Bot. Dept. Karachi Univ. Mont.
- Iqbal SH, Khalid AN, Afshan NS, Niazi AR. 2008. Rust fungi on *Saccharum* species from Pakistan. Mycotaxon 106: 219–226.
- Khalid AN, Afshan NS. 2009. Addition to the graminicolous rust fungi of Pakistan. Mycotaxon 108: 175–183. <http://dx.doi.org/10.5248/108.175>
- Khalid AN, Iqbal SH, Ahmad F. 1993. Rust flora of Pakistan. *Uredinales* collected in Salt Range, Pakistan. Sci. Int. (Lahore) 5(2): 211–214.